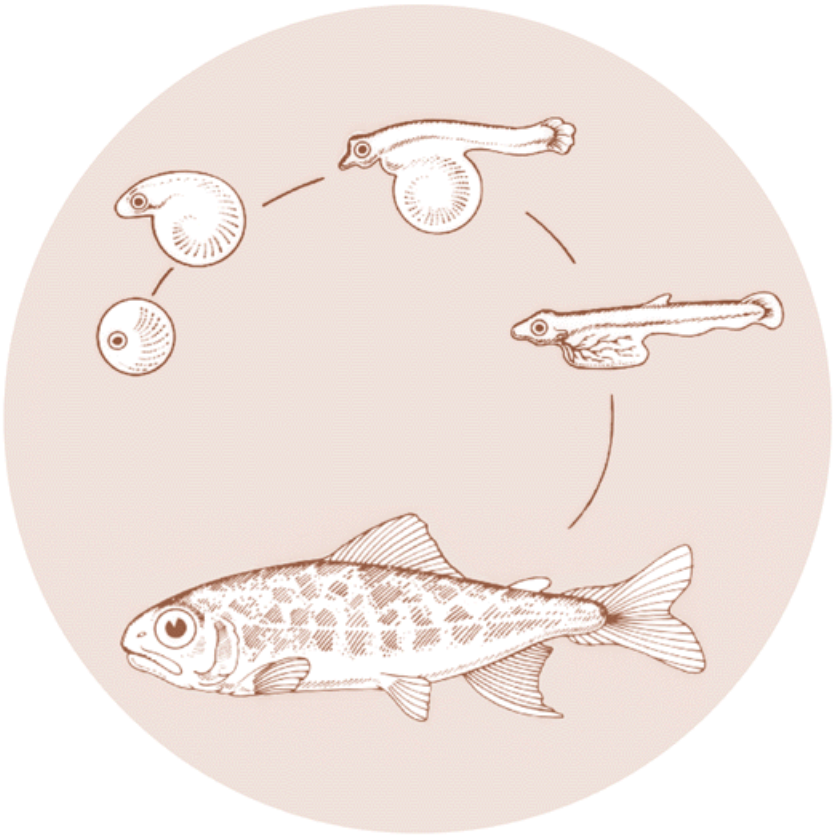
May 1996

HATCHERY EVALUATION REPORT
LYONS FERRY HATCHERY - FALL CHINOOK

An Independent Audit Based on Integrated Hatchery Operations Team (IHOT) Performance Measures



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HATCHERY EVALUATION REPORT

LYONS FERRY HATCHERY - FALL CHINOOK

An Independent Audit Based on Integrated Hatchery Operations Team (IHOT) Performance Measures

Prepared by:

Montgomery Watson

Bellevue, WA 98005

Prepared for:

U. S. Department of Energy
Bonneville Power Administration
Environment, Fish and Wildlife
P.O. Box 3621
Portland, OR 97208-3621

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CONTENTS

List of Tables

Table

Section 1

Executive Summary

This report presents the findings of the independent audit of the Lyons Ferry Hatchery (Fall Chinook). Lyons Ferry Hatchery is located downstream of the confluence of the Palouse and Snake rivers, about 7 miles west of Starbuck, Washington. The hatchery is used for adult collection of fall chinook and summer steelhead, egg incubation of fall chinook, spring chinook, steelhead, and rainbow trout and rearing of fall chinook, spring chinook, summer steelhead, and rainbow trout.

The audit was conducted in April 1996 as part of a two-year effort that will include 67 hatcheries and satellite facilities located on the Columbia and Snake River system in Idaho, Oregon, and Washington. The hatchery operating agencies include the U.S Fish and Wildlife Service, Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, and Washington Department of Fish and Wildlife.

Background

The audit is being conducted as a requirement of the Northwest Power Planning Council (NPPC) "Strategy for Salmon" and the Columbia River Basin Fish and Wildlife Program. Under the audit, the hatcheries are evaluated against policies and related performance measures developed by the Integrated Hatchery Operations Team (IHOT). IHOT is a multi-agency group established by the NPPC to direct the development of new basinwide standards for managing and operating fish hatcheries. The Bonneville Power Administration (BPA) contracted with Montgomery Watson to act as an independent contractor for the audit.

IHOT has established five basic policies that cover: (1) hatchery coordination, (2) hatchery performance standards, (3) fish health, (4) ecological interaction, and (5) genetics. The audit focuses on all these policies, with the exception of hatchery coordination. These policies are set forth ***in Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries*** *(IHOT* 1995). That document is the source for the performance measures that are the basis of this audit.

The Audit Process

The audit was based on the facility management's response to a 98-page questionnaire. This audit form was completed through a five-step process in which:

- Information was obtained from headquarters sources
- The hatchery manager was asked to fill out and return the audit form
- A l-2 day site audit inspection visit was conducted to inspect facilities, review hatchery records, discuss audit form responses, and develop remedial action plans
- A compliance report was developed to document the compliance status of each performance measure. This report was then shared with the hatchery manager and MOT representative.

- This hatchery evaluation report was written to document compliance with MOT performance measures and develop cost estimates for remedial actions when needed.

Lyons Ferry Hatchery (Fall Chinook) Audit Results

The Lyons Ferry facility includes 4 raceways for adult holding, 47 raceways and 3 earthen ponds for rearing, incubation facilities, and 4 satellite facilities. Lyons Ferry Hatchery was constructed under the Lower Snake River Compensation Program as partial mitigation for federal dams constructed on the lower Snake River. The hatchery started operation in 1984.

The hatchery was in general compliance with most of the performance measures. In the facilities requirements area, the audit found that the hatchery needed a chiller for incubation and some modifications to the release structure. The audit found that the hatchery did not have information on some of the water chemistry and contaminant parameters. In the area of genetics policy, the hatchery did not have a written broodstock collection plan or a Genetics Monitoring and Evaluation Program in place.

The specific areas in which the Lyons Ferry Hatchery (Fall Chinook Program) requires remedial actions based on the IHOT performance measures are listed below. These remedial actions are listed in order of occurrence on the questionnaire without intent of ranking or otherwise assigning priority:

- Chiller for incubation
- Monitor total gas pressure and dissolved oxygen
- Monitor water chemistry parameters on routine basis
- Monitor water contaminants on routine basis
- Modification to release structure to allow removal of safety rack
- Regional quality control officer to oversee production procedures and monitor feed quality
- Need to measure smoltification
- Conflict between WDFW and IHOT disinfection policies
- Reduction of DO to 8 ppm after transport system is functioning properly
- Develop broodstock collection plan for IHOT Operations Plan
- Develop genetics monitoring and evaluation plan for IHOT Operations Plan

Non-compliance issues resulting from items beyond human control or Performance Measures not relevant to this hatchery (Type 1 in Table 2, Section 4) were not listed above.

Section 2

Facility Description

Name: Lyons Ferry Hatchery

Stock/Species: Fall Chinook, Spring Chinook, and Summer Steelhead

Operating Agency: Washington Department of Fish and Wildlife

Funding Agency: U.S. Fish & Wildlife Service

Location: Lyons Ferry Hatchery is located downstream of the confluence of the Palouse and Snake rivers, about 7 miles west of Starbuck, Washington at an elevation of 526 feet above sea level.

Address:
Lyons Ferry Hatchery
Washington Department of Fish and Wildlife
Box 278
Starbuck, WA 99359

Complex Manager: Mr. Butch Harty

Phone **(509) 646-3454**

Fax: **(509) 646-3400**

Purpose: Lyons Ferry Hatchery was constructed under the Lower Snake River Compensation Program as partial mitigation for federal dams constructed on the lower Snake River. The hatchery started operation in 1984.

The purpose of the Fall Chinook program is to provide fish for the ocean and river fisheries.

Production Goal:

Fall Chinook
800,000 smolts (8/lb) for on-station release

Spring Chinook

132,000 fingerling (35/lb) for transfer to Tucannon Hatchery for final rearing and acclimation

Summer Steelhead
931,200 smolts (4-8/lb) for on-station and for release from satellite facilities

Rainbow Trout
353,000 legal sized fish and 200,00 sub-legal fish (108,000 lb)

Total Production: 423,800 lb (average of 1993-5)

Water Supply: Water is supplied to the hatchery from wells. No river water is currently being used.

Facilities:

Incubation:	112 16-stack vertical tray 88 shallow troughs 4 deep tanks
Adult Holding	4 raceways, 11,800 cf each
Raceways	28 raceways, 3,000 cf each 19 raceways, 3220 cf each
Rearing Ponds	3 earthen ponds, 675,000 cf each (these ponds are commonly called the "lakes")
Satellite Facilities	Tucannon Hatchery (Spring Chinook, trout, and Steelhead programs) Curl Lake Rearing Pond (Steelhead program) Cottonwood Rearing Pond (Steelhead program) Dayton Rearing Pond (Steelhead program)

Section 3

Compliance Status

The hatchery audits are based on compliance with written IHOT performance measures. These performance measures are documented in ***Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries*** (referred to as *IHOT 1995* in this report).[1] The purpose of the performance measures is to implement new basinwide policies that provide regional guidelines for operating anadromous hatcheries in the Columbia Basin.

The audit focuses on performance measures for IHOT policies that cover (1) hatchery performance standards, (2) fish health, (3) ecological interaction, and (4) genetics. These performance measures are intended to guide hatchery operations once production is established. For that reason, the hatchery operations audited included broodstock collection, spawning, incubation of eggs, fish rearing and feeding, fish release, equipment maintenance and operations, and personnel training. Production priorities are beyond the scope of this audit.

Based on *IHOT* 1995, a detailed 98 page audit form was developed. The audit form divided the performance measures into six major sections along major program and technical criteria areas. Section 7 includes general information needed for the audit:

Section 1	Performance Measures for Program Objectives (PMs l-4)
Section 2	Performance Measures for Facility Requirements (PMs 5-15)
Section 3	Performance Measures for Hatchery Practices (PMs 16-25)
Section 4	Performance Measures for Fish Health Policy (PMs 26-34)
Section 5	Performance Measures for Ecological Interactions (PMs 35-38)
Section 6	Performance Measures for Genetics Policy (PMs 39-43)
Section 7	Performance Measures for General Information (PMs General l-2)

Several performance measures are repeated in various sections of the audit. These performance measures overlap in *IHOT 1995* and were retained to allow individuals interested in specific portions of the audit (such as Genetics or Fish Health) to determine the compliance status of all performance measures for a given topic in one location. A repeated performance measure is indicated by light gray shading.

The Hatchery Audit Process

The hatchery audit will be conducted over a two-year period that concludes in 1997. This report covers phase one of the audit, which consists of an audit of four hatcheries and seven species or stocks of fish. At each hatchery, a five-step process was used to complete the overall hatchery audit. This process consisted of research and on-site visits. The site visits were conducted from March 4 to March 8.

'Integrated Hatchery Operations Team (MOT) 1995. ***Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries***, Bonneville Power Administration, Portland, Oregon.

The following is the five step audit process:

1. Information was obtained from headquarters sources.

2. The hatchery manager **was** asked to **fill** out and return **the Audit Form.**

3. A l-2 day site audit inspection visit was conducted at each hatchery. During that visit an audit team inspected facilities, reviewed hatchery records, discussed audit form responses, and developed remedial action plans when appropriate.

4. A **Compliance Report** was developed to document the compliance status of each performance measure. During the site visit, the compliance status of each performance measure was discussed with the hatchery manager and IHOT representative.

5. This information **was** used to develop a draft **Hatchery Evaluation Report.** Based on review and comments of this prototype document, a final Hatchery Evaluation Report was developed. The final report documents the compliance of a particular hatchery with the IHOT performance measures and presents cost estimates to correct any deficiencies.

Compliance Status of Lyons Ferry Hatchery (Fall Chinook)

This section documents the compliance status of the Lyons Ferry Hatchery (Fall Chinook). Each performance measure is presented in a table taken from the audit form (Table 1). The compliance status is identified by the following categories:

- **N/A** (not applicable)
- Yes (in compliance)
- ? (unknown; generally due to unavailability of information to determine compliance)
- No (not in compliance).

Remedial actions are suggested for performance measures not in compliance. These remedial actions are grouped into categories and listed in Section 4, where the cost of the required remedial actions is also presented.

Table 1 Lyons Ferry Hatchery Hatchery Compliance (Fall Chinook) With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Corn pliance
		N/A	Yes	?	No		
#1	**Are the hatchery programs outhned in a subbasin management plan?**		✔			Lower Snake River Compensation Plan & U.S. vs. Oregon	
#2	**Is the hatchery operating under a current hatchery operational plan?**		✔			Review of IHOT Operational Plan	
	Is it understood by staff?		✔			Discussion	
	Is it being followed?		✔			Discussion	
#3	**Is a hatchery monitoring and evaluation plan in place?**		✔			5-Year Plan & Annual Reports	
#4	**Specific performance measures include:**						
#4a	**Adult contribution to fisheries, spawning grounds and hatchery**		✔			Review of records/Discussion	
#4b	**Adult pre-spawning survival as compared with established goal**		✔			Review of records	
#4c	**Egg-take as compared with established hatchery goal**				✔	0 years out of 5 in compliance	None; rebuilding run
#4d	**Green-egg-to-eyed-egg survival as compared with established goal**	✔				No goal listed in Operation Plan	
#4e	**Eyed-egg to fry survival as compared with established goal**	✔				No goal listed in Operation Plan	
#4f	**Fry-to-smolt survival as compared with established goal**		✔			Review of records/Discussion	
#4g	**Production as compared with established goal**				✔	0 out of 5 years in compliance	Need better returns
#4h	**Percent survival (smolt to adult) as compared with established goal**				✔	0 out of 5 years in compliance	Need better returns
#4i	**Number of eggs, fry, fingerlings, smolts and/or adults to meet basinwide needs**	✔					

Table 1 Lyons Ferry Hatchery Hatchery Compliance (Fall Chinook) With Performance Measures

'M #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#5	**Water quality**						
#5a	**Temperature**						
	Do your water temperatures meet the criteria for spawning?		✔			Review of records/Discussion	
	Do your water temperatures meet the criteria for incubation?		✔			"	Need chiller to control development: 150 gpm @AT= -10°F
	Do your water temperatures meet the criteria for rearing?		✔			"	
#5b	**Dissolved gases**						
	Is the oxygen level near saturation?			✔		No data provided	Monitor total gas pressure (TGP) and dissolved oxygen (DO)
	Is the dissolved nitrogen level less than saturation?			✔		No data provided	
#5c	**Chemistry**						
	Ammonia (unionized)			✔		No data	Run analysis
	Carbon Dioxide			✔		No data	Run analysis
	Chlorine			✔		No data	Run analysis
	PH			✔		No data	Run analysis
	Copper				✔	Limited data	Run analysis to confirm
	Hydrogen Sulfide			✔		No data	Run analysis
	Iron				✔	Limited data	Run analysis to confii
	Zinc		✔				
#5d	**Turbidity**						
	Does your turbidity meet the criteria?		✔			Groundwater supply; not a problem	
#5e	**Alkalinity and hardness**						
	Does your alkalinity and hardness meet the criteria?		✔			Review records	
#5f	**Nitrite**						
	Does your nitrite meet the criteria?		✔			Review records	

Table 1 Lyons Ferry Hatchery Hatchery Compliance (Fall Chinook) With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#5g	**Contaminants**						
	Aldrin			✔		No data	Run analysis
	Endrin			✔		No data	Run analysis
	Dieldrin			✔		No data	Run analysis
	Heptachlor			✔		No data	Run analysis
	Chlordane			✔		No data	Run analysis
	Methoxychlor			✔		No data	Run analysis
	Lindane			✔		No data	Run analysis
	Malathion			✔		No data	Run analysis
	Guthion			✔		No data	Run analysis
#5h	**Pathogens**						
	What portions of the hatchery have disease-free water?						
	Adult holding?		✔			Groundwater supply	
	Incubation?		✔				
	Early rearing?		✔				
	Rearing?		✔				
	Acclimation ponds?				✔	Use surface water	

Table 1 Lyons Ferry Hatchery Hatchery Compliance (Fall Chinook) With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#6	**Alarm Systems**						
	Do the following areas have alarms?						
	Intake?		✔			Inspection/Discussion	
	Large rearing ponds and adult holding ponds?		✔			" "	
	Raceway headboxes and rearing ponds?		✔				
	Incubation facilities?	✔					
	Quarantine areas and facilities?	✔					
	Water treatment systems?		✔			Discussion	
	Security?		✔			Discussion	
	Are there outside systems and buzzers in on-site residences?		✔			Some checked daily	Need more frequent checking
	Are water flow alarms checked daily?		✔			Discussion	
	Are all other alarms checked weekly?		✔			Discussion	
	Is there a log of alarms for emergencies, tests, and maintenance requirements				✔	2 people on station with alarms in residences	None
	Are telephone pagers used?						
#7	**Adult collection and holding facilities**						
	Do you meet the adult holding criteria?		✔			Review of records/Discussion	
#8	**Incubation facilities**						
	Type 1: Vertical Tray Do you have an adequate number of units for the overall program?		✔			Inspection of facilities/Discussion	

Table 1 Lyons Ferry Hatchery Hatchery Compliance (Fall Chinook) With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Corn pliance
		N/A	Yes	?	N o		
#9	**Rearing facilities**						
	Type 1: Raceways Do you have an adequate number of units for the overall program?		✔			Inspection of facilities/Discussion	
	Type 2: Lakes Do you have an adequate number of units for the overall program?		✔			Inspection of facilities/Discussion	
	Type 3: Adult Holding Ponds Do you have an adequate number of units for the overall program?		✔			Inspection of facilities/Discussion	Release structure needs modification: safety rack over outlet pipe needs to be removable
#10	**Screening facilities**						
	Do you meet the approach velocity criteria:	✔				Groundwater supply; not applicable	
	Are the fish screens regularly cleaned?	✔				Groundwater supply; not applicable	
	Are rearing containers double screened for fish that should not be released to adjacent water?	✔				Released on-site	
#11	**Predator control facilities**						
	Are your predation control facilities effective?		✔			Inspection of facilities/Discussion	

Table 1 Lyons Ferry Hatchery Hatchery Compliance (Fall Chinook) With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#12	**Food storage facilities and quality control**						
	Does the storage of dry/semi-moist/moist foods follow food manufacturer's recommendations? (dry<12%; semi-moist 12-20%; moist >20% moisture)		✔			Discussion	
	Does a regional quality control officer oversee production procedures and monitor:						
	Verification by feed manufacturer that ingredients meet specifications?				✔	Discussion	This should be addressed at State or regional level; not hatchery responsibility
	Ensure feeds do not contain unwanted drugs or other additives?				✔	Discussion	
	Analyze ingredients contained in the final food product to ensure that feed specifications have been met?				✔	Discussion	
	Are the storage and handling of foods followed according to the following criteria?		✔				
	Moist pellets should not exceed 10°F at point of delivery?		✔			Discussion	
	Moist pellets should be removed from freezer just prior to feeding?		✔			Discussion	
	Do not leave buckets of feed or feed containers outside exposed to light or heat?		✔			Discussion	
	Open bags of feed should be fed within one to two days except when feeding small groups of fish?		✔			Discussion	
	Automatic feeder hoppers and bulk storage facilities should be insulated against excessive temperatures (80°F and above).					Discussion	

Table 1 Lyons Ferry Hatchery Hatchery Compliance (Fall Chinook) With Performance Measures

PM #	Description of Performance Measure	Compliance				Basis for Compliance or Non-Compliance	Remedial Action Needed for Corn pliance
		N/A	Yes	?	No		
#13	**Release facilities**						
	Do the release facilities ensure that fish are not subjected to adverse conditions?		✔			Inspection of facilities/Discussion	
#14	**Pollution abatement facilities**						
	Do the pollution abatement facilities meet all federal and state regulations (or good engineering practice)?		✔			Inspection of facilities/Discussion	
	Are pollution abatement facilities operated correctly?		✔			Discussion	
#15	**Transportation facilities**						
	Are the transport systems adequate to meet IHOT performance measures for transportation practices?		✔			Discussion	

Table 1 **Lyons Ferry Hatchery Hatchery Compliance (Fall Chinook) With Performance Measures**

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Corn pliance
		N/A	Yes	?	No		
#16	**Broodstock selection practices**						
	Is the donor selection process document attached?	✔				Existing Program; does not apply	
	Was the donor selection outline followed in selecting the hatchery broodstock?	✔				Existing Program; does not apply	
	Go to PM #40 in Genetics						
#17	**Spawning practices**						
	Were the appropriate number of spawners, male/female ratios, and fertilization protocols used?		✔			Review of records/Discussion	
	Go to PM #42 in Genetics Section						
#18	**ncubation practices**						
	Are specific incubation standards listed in the hatchery operations plan?		✔			In hatchery Operations Plan	Include in IHOT Operations Plan
	Are incubation practices written?		✔			In hatchery Operations Plan	
	Incubation Type 1: Vertical Tray See PM #8) Do you meet the loading and flow criteria?		✔			Review of records/Discussion	
#19	**&earing practices**						
	Are specific rearing standards listed in the hatchery operations plan?		✔			In hatchery Operations Plan	Include in IHOT Operations Plan
	Are rearing practices written?		✔			In hatchery Operations Plan	
	Rearing Unit Type 1: Raceways (see PM 9)						
	Do you meet the density and DI criteria?				✔	Exceed density and DI criteria at end of production cycle	Should not be a problem in future given the availability of lakes after consolidation of the two departments
	Do you meet the loading and Fl criteria?				✔	Exceed loading and Fl criteria at end of production cycle	

Table 1 Lyons Ferry Hatchery Hatchery Compliance (Fall Chinook) With Performance Measures

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PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#20	**Smolt quality**						
	Do you produce a high quality smolt?		✔			Discussion	
#21	**Fish health management practices**						
	Are the monthly hatchery monitoring visits being conducted? (PM #26)		✔			Review of records/Discussion	
	Are the annual broodstock inspections being conducted? (PM #27		✔			Review of records/Discussion	
	Is there pathogen-free water and are the sanitation procedures being followed? (PM #28)		✔			Review of records/Discussion	
	Are the following water quality parameters within criteria? (PM #5a-5h)		✔			Review of records	
	Water temperature		✔	✔		Review of records	Monitor total gas pressure (TGP) and dissolved oxygen (DO)
	Dissolved gases		✔	✔	✔	No data available for many parameters	Run analysis
	Chemistry		✔			Review of records	
	Turbidity					Review of records	
	Alkalinity and hardness			✔		Review of records	Run analysis
	Nitrite				✔	No Data	
	Contaminants		✔			Review of records/Discussion	Should not be a problem in future given the availability of lakes after consolidation of the two departments
	Are rearing standards being followed? (PM #19)					Review of records/Discussion	
	Are egg and fish transfer/release requirements met? (PM #31)						

Table 1 Lyons Ferry Hatchery Hatchery Compliance (Fall Chinook) With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Corn pliance
		N/A	Yes	?	No		
#22b	**Are fish reared ın the subbasin or acclimated in the subbasin?**						
	Are the fish reared in the subbasin?		✔			Discussion	
	Are the fish acclimated in the subbasin?		✔			Discussion	
#22c	**Is the release strategy appropriate for the program?**		✔			Discussion	

Table 1 Lyons Ferry Hatchery Hatchery Compliance (Fall Chinook) With Performance Measures

PM	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Corn pliance
		N/A	Yes	?	No		
#23	**Transportation facilities**						
	Do transportation equipment and personnel receive disinfection before and after use?		✔			Discussion	
	Disinfection of fish tank interior using a solution of 200 ppm active chlorine for 30 minutes minimum or formaldehyde gas generation method (relative humidity of 60% for 2 hrs)?				✔	WDFW policy is 10 minutes	Conflicting policies; change WDFW policy or IHOT policy
	Disinfection of fish transport vehicle exterior using high pressure steam (115-130°C), high temperature acid, or with 200 ppm chlorine for 30 minutes?		✔			Discussion	
	Disinfection of fish transport vehicle (cab) using 600 ppm quaternary ammonia compounds (1.5 ml of 50% stock solution/liter water)?		✔			Not every time	Increase frequency of cleaning
	Disinfection of other equipment including fish pumps, nets, egg sorters, waders, boots, rain gear, hoses and other equipment use one of the following solutions?					Discussion	
	200 ppm chlorine for 30 minutes 600 ppm quatemary ammonia compound for 30 minutes 200 ppm iodophor solution for 10 minutes		✔ ✔			Discussion	
	Do personnel wear protective garments when handling fish eggs, or cultural water?		✔			Discussion	
	Do the fish transport truck/chassis and tank/unit receive an inspection and service prior to the release season?		✔			Discussion	
	Is a daily service inspection completed before starting up and leaving for the day?					Discussion	
	Does the fish transport unit receive an inspectio prior to loading?						

Table 1 Lyons Ferry Hatchery Hatchery Compliance (Fall Chinook) With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#23 (cont)	**Transportation facilities**						
	Does a pre-loading inspection covering the following: tank water level, pumps or aerators, oxygen injection system settings, displacement gauge, and truck loading/hauling density tables checked and reviewed occur prior to loading the fish in the transport unit?		✔			Discussion	
	Do hauling criteria include checking the fish 45 minutes to 1 hour after loading occur?		✔			Discussion	
	When fish are active and systems are functioning properly, is the oxygen concentration reduced and maintained approximately 8 ppm?			✔		Uncertain	Modify procedures if necessary
	Is water temperature in the transportation unit maintained within 42-48°F range?				✔	Fish are hauled in 51 - 53°F water, which is the temperature of the rearing water	None
	Do fish releasing procedures include the following criteria?						
	Releasing the fish at the correct release site or into the correct water body.		✔			Discussion	
	Tempering or the difference between the liberation tank and the target water body should not exceed 10°F.		✔			Discussion	
	The liberation hose should be angled so that fish gently hit the water. Using a tripod is a method of ensuring the hose will stay at the proper angle.		✔			Discussion	

Table 1 Lyons Ferry Hatchery Hatchery Compliance (Fall Chinook) With Performance Measures

'M #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#24	**Evaluation practices**						
	Has the hatchery conducted fishery contribution studies to:						
	Determine the requirements for evaluating and improving management programs?		✔			Discussion with hatchery staff & evaluation biologists	
	Develop guidelines that define the geographical area and identify component stocks (hatchery and/or wild) that comprise the management unit?		✔			" "	
	Develop guidelines that define if the proper stocks of fish are currently being used?		✔				
	Determine which management units contribute to a specific fishery and the time periods of those contributions?		✔				
	Determine the relative contributions of the various management units to a specific fishery over the different time periods?		✔				
#25	**Training practices**						
	Does the hatchery have a training schedule for its staff?		✔			Discussion	
	Does each staff member have a personal training plan approved by a supervisor and reviewed annually?		✔			Discussion	
	Does the hatchery routinely exchange training details between other hatcheries and agencies?		✔			Discussion	
	Does the hatchery encourage and reward off-duty training of staff?		✔			Discussion	
	Does the hatchery conduct monthly staff meetings'?		✔			Discussion	

Table 1 **Lyons Ferry Hatchery Hatchery Compliance (Fall Chinook) With Performance Measures**

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#26	**Are monthly hatchery monitoring visits being conducted by a qualified fish health specialist?**		✔			Review of records/Discussion	
#27	**Are all of the functions of the hatchery yearly monitoring visits being completed as described below?**		✔			Review of records/Discussion	
#28	**Is the hatchery following accepted sanitation procedures?**						
	Are there any sources of pathogen-free water, especially for incubation and early rearing?		✔			Groundwater supply	
	Are the hatchery sanitation procedures understood and being followed?		✔			Inspection of facilities/Discussion	
#29	**Are water quality parameters being followed?**						
	Are the following water quality parameters within criteria? (PM #5a-5h)						
	Water temperature		✔			Review of records	
	Dissolved gases			✔		No data	Monitor TGP and DO
	Chemistry		✔	✔	✔	No data for many parameters	Run analysis
	Turbidity		✔			Review of records	
	Alkalinity and hardness		✔			Review of records	
	Nitrite		✔			Review of records	
	Contaminants			✔		No data	Run analysis
	Go to PM #21						

Table 1 Lyons Ferry Hatchery Hatchery Compliance (Fall Chinook) With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		

Table 1 Lyons Ferry Hatchery Hatchery Compliance (Fall Chinook) With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Corn pliance
		N/A	Yes	?	No		
#30	**Are incubation and rearing standards being followed?**						
	Are the incubation practices being following the IHOT incubation criteria? (PM #18)		✔			Review of records/Discussion	
	Are the rearing practices following the IHOT criteria? (see PM #19)				✔	Review of records/Discussion	Should not be a problem in future given the availability of lakes after consolidation of
	Go to Rearing practices, PM #18-PM #19						
#31	**Are egg and fish transfer/release requirements met?**			✔		Discussion	

Table 1 Lyons Ferry Hatchery Hatchery Compliance (Fall Chinook) With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes		No		
#35	**Does the hatchery program meet requirements established in the regional hatchery policies and subbasin planning documents in the following areas: species, stock, broodstock collection location, broodstock numbers, broodstock collection strategy, and spawning and egg-take protocols.**						
	Does the hatchery program meet the requirements for the following: (PM #1-PM #2)		✔			Review of records/Discussion	
	Species protocols? (PM #4a)		✔			Review of records/Discussion	
	Stock protocols? (PM #4a)		✔			Review of records/Discussion	
	Broodstock collection location protocols? (PM #41)		✔			Review of records/Discussion	
	Broodstock numbers protocols? (PM #42)		✔			Review of records/Discussion	
	Broodstock collection strategy protocols? (PM #41)		✔			Review of records/Discussion	
	Spawning protocols? (PM #42)		✔			Review of records/Discussion	
	Egg-take protocols? (PM #42)						

Table 1 Lyons Ferry Hatchery Hatchery Compliance (Fall Chinook) With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#36	**Does the hatchery's performance meet requirements outlined in the regional hatchery policies and in subbasin and hatchery plans for the following areas: percent smoltification, rearing density, disease condition, and the number, size date(s), and location at release.**						
	Percent smoltification (PM #22a1)	✔				No goal found	
	Rearing density (PM #22a2)		✔			Review of records/Discussion	
	Disease condition (PM #22a3)		✔			Review of records/Discussion	
	Number at release (PM #22a4)				✔	Review of records/Discussion	Need better adult returns
	Size at release (PM #22a5)				✔	Review of records/Discussion	Need chiller for incubator
	Date of release (PM #22a6)		✔			Review of records/Discussion	
	Location at release (PM #22a7)		✔			Review of records/Discussion	
#37	**Are fish reared in the subbasin or acclimated in the subbasin?** See PM #22b		✔			Review of records/Discussion	
#38	**Is the release strategy appropriate for the program?** See PM #22c		✔			Discussion	

Table 1 Lyons Ferry Hatchery Hatchery Compliance (Fall Chinook) With Performance Measures

PM #	Description of Performance Measure	Compliance Status			Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	No		
#39	**For new programs, has a broodstock collection plan been developed?**					
	Is the'broodstock collection plan written?	✔			Existing program; does not apply	
	For a non-captive broodstock program:					
	Was an unbiased, representative sample collected?	✔			Existing program; does not apply	
	Was the recommended number of broodstock collected?	✔			Existing program; does not apply	
	For a captive broodstock program:					
	Were captive brood progeny excluded as donors for propagating the next generation of the captive broodstock program?	✔			Existing program; does not apply	
	Were full-sib crosses avoided?	✔			Existing program; does not apply	
	Is the broodstock collection plan understood and being followed by staff?				Existing program; does not apply	
#40	**For a new program, was the donor selection outline followed in selecting the hatchery broodstock?**					
	Is a donor selection plan written?					
	Was the donor selection outline followed in the selecting the broodstock?	✔			Existing program; does not apply	
	Was the target stock recommended in the donor selection process actually used?	✔			Existing program; does not apply	
		✔			Existing program; does not apply	

Table 1 Lyons Ferry Hatchery Hatchery Compliance (Fall Chinook) With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Corn pliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#41	**For existing programs, were the broodstock collection procedures followed?**						
	Is the'broodstock collection plan written?				✔	None provided to inspection team; a fall chinook management plan will be completed by December 1996	Develop plan for IHOT Operational Plan
	Does the broodstock collection plan follow the guideline:						
	Was an unbiased, representative sample collected?		✔			Discussion	
	Was the recommended number of broodstock collected?		✔			Discussion	
	Were the broodstock collection procedures in hatchery operation plan understood and followed?		✔			Discussion	

Table 1 Lyons Ferry Hatchery Hatchery Compliance (Fall Chinook) With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#42	**Were the appropriate number of spawners, male/female ratios, and fertilization protocols used?**						
	Are the spawning protocols written?		✔			Review of hatchery documents	Include in IHOT Operational Plan
	Are daily or weekly spawning logs available?		✔			Review of records/ Discussion	
	Were the appropriate number of spawners used?		✔			Review of records/ Discussion	
	Did you attempt to spawn all collected broodstock and randomize mating with respect to age class, and other traits?		✔			Review of records/ Discussion	
	Was the sex-ratio within the limits given in the performance standards?		✔			Review of records/ Discussion	
	Were the fertilization protocols followed?	✔				Review of records/ Discussion	
	If the hatchery needed to reduce the number of eggs retained, was this done by representative sampling of each male/female cross?						

Table 1 Lyons Ferry Hatchery Hatchery Compliance (Fall Chinook) With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#43	**Is there a genetics monitoring and evaluation program in place?**						
	Is a genetics monitoring and evaluation program available?				✔	None provided to inspection team; collection of baseline samples is being done	Develop plan for IHOT Operational Plan
	Does the plan address the following elements listed in IHOT:						
	Does the program have elements needed to meet evaluation goals 1-4?	✔					
	Has a qualified geneticist reviewed and endorsed the program (goal 5)?	✔					
	Will the program collect the data and maintain the records needed to evaluate compliance on an ongoing basis (goal 5)?	✔					
	Is it understood and followed by staff?	✔					

Section 4

Remedial Actions

Based on the compliance status for each performance measure, remedial actions were developed. The required remedial actions are organized into five categories. The types of categories range across a spectrum from those actions that are beyond human control to those that require a change in agency policy or procedures to those that have a significant capital cost to put in place. The following are the five types of remedial actions identified under phase 1 of the audit:

The Five Types of Remedial Actions

Type	Description
1	Non-compliance issues resulting from items beyond human control or PM not relevant for this hatchery
2	Remedial actions requiring changes in agency policies or procedures
3	Remedial actions requiring changes in monitoring coverage or interval
4	Remedial actions requiring significant capital expenditures
5	Remedial actions that may require significant capital expenditures but not clearly definable at this time

Remedial Actions at Lyons Ferry Hatchery (Fall Chinook)

This section presents the corrective actions required to bring the Lyons Ferry Hatchery Fall Chinook program into compliance with the MOT performance measures. The remedial actions suggested here are just that, suggestions developed by the Montgomery Watson Audit Team. For some non-compliance areas, other remedial actions could be proposed. The required remedial actions are cross-referenced to each IHOT performance measure that was not in compliance. Where appropriate, the costs associated with the remedial actions are also presented (Table 2).

The cost estimates presented in this section are based on professional experience from similar projects. In most cases, only a lump-sum figure is presented and detailed take-off lists have not been prepared. The cost estimates are essentially order of magnitude estimates (± 40%).

More importantly, the suggested remedial activities may also present several levels of action. Optional actions have been listed for several problems. These optional actions are desirable for either operational or safety considerations.

Table 2. Remedial Actions Required at Lyons Ferry Hatchery (Fall Chinook)

Remedial Action Required	Cost	PMs[2]
Type 1 - Non-compliance issues resulting from items beyond human control or PM not relevant for this hatchery		
Need better adult returns		4c,4g, 4h, 22a4,36
No telephone pagers in use (Not a problem because two people always on station, have alarms on station)		6
Plow and density greater than criteria - (use of lakes will prevent this problerr in the future)		19,21, 30
Hauling temperatures higher than criteria		23
Type 2 - Remedial actions requiring changes in agency policies or procedures		
Regional quality control officer to oversee production procedures and monitor feed quality	----	12
Include specific incubation standards in IHOT Operations Plan	----	18
Include specific rearing standards in IHOT Operations Plan	----	19
Measure percent smoltification	----	22al
Conflict between WDFW and IHOT disinfection policies	----	23
Reduction of DO to 8 ppm after transport system is functioning properly	---	41
Develop broodstock collection plan for IHOT Operations Plan	----	42
Include spawning protocols in IHOT Operations Plan	-----	43
Develop genetics monitoring and evaluation plan for IHOT Operations Plan	-----	
Type 3 - Remedial actions requiring changes in monitoring coverage or interval		
Monitor total gas pressure and dissolved oxygen (instruments only)	$4000	5b,21, 29
Monitor chemistry parameters on routine basis	$200/year	5c,29
Monitor contaminants on routine basis	$400/year	5g

[2] PMs are Performance Measures that were extracted from the IHOT 1995 report. The IHOT Performance Measures are listed in Table 1 in Section 3 in numerical order.

Remedial Action Required	cost	PMs[2]
Type 4 - Remedial actions requiring significant capital expenditures		
Chiller for incubation 100 ton chiller (shipping, installation, and taxes)	$200,000	5a, 22a5,36
Modification to release structure to allow removal of safety rack	$10,000	9
Type 5 - Remedial actions that may require significant capital expenditures but not clearly definable at this time		
None		

Section 5

Hatchery Contribution to Fisheries, Spawning Grounds and Hatcheries

This section presents the audit findings for the Lyons Ferry Hatchery's Fall Chinook contribution of adult fish to fisheries, spawning grounds, and hatcheries. Data is reported by broodyear. A broodyear refers to the adult contribution from the eggs produced from a single group of spawning adults. For some species, this may include fish caught as 2, 3, 4, 5, and 6-year old fish. Because of the return distribution and data processing delays, the complete adult contribution for a given broodyear may not be available until 4-5 years after the fish have been released from the hatchery.

Table 3. Adult Contribution to Fisheries, Spawning Grounds, and Hatcheries - Lyons Ferry Hatchery (Fall Chinook)

Year	Fisheries' (Broodyear)	Spawning Grounds' (Broodyear)	Hatchery' (Broodyear)	Smolt to Adult Survival (percent)
1981				
1982				
1983	39,097	---	9,369	7.31
1984	5,400	---	1,027	0.65
1985	6,108	---	1,142	0.58
1986	5,711	---	1,610	0.83
1987	2,057	---	526	0.32
1988	4,594	---	1,516	0.62
1989	382	---	110	0.098
1990	489	---	413	0.10
1991				
1992				

[3] Data obtained from Missing Production Groups Annual Reports or from the Regional Mark Information system database.

Section 6

Annual Operating Expenditures

The level and &tail of annual operating expenditures varies widely depending on hatchery, operating agency, and funding source. When provided, expenditures were presented in **terms** of personnel costs, operating costs (power, feed, supplies), capital costs, indirect costs charged **to the Federal government,** third-party **costs,** and other **costs. These cost components** were summed to determine a total hatchery annual cost. Based on discussion with the hatchery manager, the percent of total hatchery costs allocated to a given program were estimated. The total hatchery costs and the percent of hatchery costs allocated to a given program were used to compute the cost of a given program. Table 4 shows the annual operating expenses for the Lyons Ferry Hatchery (Fall Chinook).

Table 4. Annual Operating Expenses - Lyons Ferry Hatchery (Fall Chinook)

Component	1994	1995	1996
Personnel Costs[4]			
Operational Costs[4]			
Capital Costs[4]			
Indirect Costs[4]			
Lumped Hatchery Costs[5] [6]	$1,970,244	$1,761,325	$2,194,283
Lumped Third Party Costs			
Total Hatchery Costs	**$1,970,244**	**$1,761,325**	**$2,194,283**
Source of Funds			
COE	100%	100%	100%
Program Production (lb)	58,212	44,746	
Total Production (lb)	437,793	373,756	
Program as Percent of Total	13%	12%	12[7]
Program Costs	**$261,977**	**$210,866**	**$263,314**

[4] The levels of detail for expense information was expanded after the Phase 1 data collection process was completed. This table will be updated at the completion of Phase 2.
[5] When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.
[6] Does not include unspent capital budget for 1994 and 1995; includes costs for Lyons Ferry Hatchery, Tucannon Hatchery, and the satellite facilities.
[7] Assumed value based on expenditures for past year.